



George C. Marshall Space Flight Center
Marshall Space Flight Center, Alabama 35812



Materials and Processes
Laboratory, EM01

Metals Engineering
Branch, EM30

EM30-WI-006
01/21/2005

ORGANIZATIONAL WORK INSTRUCTION

EM30

THERMAL SPRAY FACILITY WORK PROCEDURES

Baseline

<u>RELEASE AUTHORITY</u>	<u>NAME</u>	<u>TITLE</u>	<u>ORG</u>	<u>DATE</u>
Management Representative	_____ Timothy P. Vaughn	Branch Chief	EM30	02/11/2005

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Thermal Spray Facility Work Procedures	Document: EM30-WI-008	Revision: Baseline
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DOCUMENT HISTORY LOG

Revision	Date	Originator	Description
Baseline	2-11-2005	T. Vaughn	Document rebaselined due to reorganization of Departments and Laboratories at the Center.

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1 SCOPE

- 1.1 **SCOPE:** This procedure covers guidelines for receiving and conducting work in the Thermal Spray Facility for the Materials and Processes Laboratory, Metals Engineering Branch's, Metallics Processing Team within the scope defined by MPD 1280.1.
- 1.2 **PURPOSE:** The purpose of this document is to outline the basic work flow and work procedures for the Thermal Spray Facility for the Metals Engineering Branch, Metallics Processing Team.
- 1.3 **APPLICABILITY:** This document is applicable to the Materials and Processes Laboratory, Metals Engineering Branch, Metallic Processing Team and support personnel who work on thermal spray activities.

2 APPLICABLE DOCUMENTS

- 2.1 MPD 1280.1 Marshall Management Manual.
- 2.2 MPR 1410.1 Document and Data Control of Organizational Issuances.
- 2.3 MPR 1440.2 MSFC Records Management Program
- 2.4 NPR 1441.1 NASA Records Retention Schedules
- 2.5 Original Equipment Manufacturer's safety and instruction/reference manuals.
- 2.6 MSFC safety and instruction/reference manuals.
- 2.7 Marshall and NASA Management Instructions.

3 DEFINITIONS

- 3.1 **THERMAL SPRAY:** The deposition of engineering materials as coatings or structures.
- 3.2 **TSF:** Thermal Spray Facility.
- 3.3 **VPS:** Vacuum Plasma Spray. A thermal spraying process variation utilizing a plasma gun confined to a solid enclosure. The enclosure is evacuated and the spraying performed under low pressure, usually below 100 torr, in inert gas. Pressure level is specific to the application. There is no requirement to operate below 100 torr. This pressure is suggested as a historically typical pressure and not a process requirement.

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- 3.4 **HVOF:** High Velocity Oxyfuel. A thermal spraying process in which a high velocity oxyfuel gas flame is the source of heat for melting the coating material, and propels the coating material to the substrate.
- 3.5 **WAS:** Wire Arc Spray. A thermal spraying process in which an arc, conducted across the ends of two wires as they are fed, melts the coating material. Compressed gas atomizes and propels the coating material to the substrate.
- 3.6 **OTHER SUPPORT WORK:** Support work performed that does not fall under the category of thermal spray.

4 INSTRUCTIONS

- 4.1 **GENERAL:** All Thermal Spray Facility work shall be controlled and documented in accordance with the requirements of each individual program.
- 4.2 **REQUESTS FOR WORK:** The ED33 Thermal Spray Facility Work Request Form, found on the Organizational World Wide Web site, <http://maptis.nasa.gov/em30/em30masterlist.html/>, must be completed and approved prior to the start of work.
 - 4.2.1 The work request form shall be filled out by the requester and/or by Organizational personnel.
 - 4.2.2 The request for work shall be approved by Branch/Team level management or their designee and assigned to appropriate personnel.
- 4.3 **WORK ACCOMPLISHMENT:**
 - 4.3.1 TSF personnel shall schedule and prioritize requested work with the Customer and Organizational management.
 - 4.3.2 Work shall be performed using VPS, WAS, or HVOF processes. Parametric data are recorded in the respective log books.
 - 4.3.3 The type and quantity of data to be recorded shall adhere to the requirements described in the work request.
 - 4.3.4 Other data, not explicitly described in the work request, may be recorded.
 - 4.3.4.1 Most data obtained during thermal spraying or other support work are processing parameters and dependent variables. These may be recorded onto paper in the form of a thermal spray data form by the equipment operator and stored. Such data may be subsequently entered and stored onto a computer file.

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4.3.4.2 Other data which may be collected include thermal spray equipment hardware used (critical gas orifice size, nozzle part number, barrel length, plasma gun part number), as well as materials sprayed, gases and fuels used, and other pertinent variables or operator observations. These data are recorded for reference and internal TSF use, and are not typically delivered to the customer unless specifically requested on the work order.

- 4.4 **DATA INTEGRITY:** Data to be reported to the Customer shall be checked by cognizant TSF personnel. Additional personnel may check the data as required by the work and/or task requirements.
- 4.5 **DATA REVIEW, APPROVAL, AND REPORTING:** Reports, memos, and data shall be reviewed, approved, and reported to the customer in accordance with standard Organizational practices described in EM30-WI-002. Any pertinent notes regarding data integrity shall be reported.
- 4.6 **RECORD ARCHIVING:** All records produced in fulfillment of customer requirements described in the work request shall be stored in accordance with standard Organizational practices found in EM30-WI-002, MPR 1440.2 and NPR 1441.1.
- 4.7 **SAMPLE DISPOSITION:** All samples and/or non-consumable Customer supplied materials shall be released to the Customer or stored in accordance with standard Organizational practices described in EM30-WI-002.
- 4.8 **WORK REQUEST CLOSE OUT:** Once all applicable work has been completed, data distributed, samples returned, and records archived, the work request shall be closed out in accordance with standard Organizational practices described in EM30-WI-002.

5 NOTES

- 5.1 None.

6 SAFETY PRECAUTIONS AND WARNING NOTES

- 6.1 All TSF personnel are shall comply with OEM and MSFC safety requirements.

7 APPENDICES, DATA, REPORTS, AND FORMS

- 7.1 Not Applicable.

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8 RECORDS

- 8.1 The following listing includes EM30 Records that are collected and saved during thermal spray activities.
 - 8.1.1 EM30 Thermal Spray Facility Work Request Logbook.
 - 8.1.2 EM30 Thermal Spray Facility Work Request Form.
 - 8.1.3 EM30 Branch Memoranda.
- 8.2 All schedules pertaining to EM30 Quality Record retention and disposition are compiled in the EM30 Quality Records Listing located on the master list of the EM30 group website <http://maptis.nasa.gov/em30/em30masterlist.html/>.

9 TOOLS, EQUIPMENT, AND MATERIALS

- 9.1 THERMAL SPRAY EQUIPMENT:
 - 9.1.1 One Electro Plasma Inc. (a.k.a. Sulzer Metco) Vacuum Plasma Spray chamber with Allen Bradley model 8200 CNC controller.
 - 9.1.2 One Hobart/TAFA model JP-5000 High Velocity OxyFuel machine.
 - 9.1.3 One Hobart/TAFA Wire Arc Spray machine comprising a model 30*8B35 power supply, model 187 automatic control module, and a model 8835 spray head.
 - 9.1.4 One TAFA Wire Arc Spray machine comprising a model 9000 spray head and controller, and model 9300 power supply.
 - 9.1.5 Thermal Spray Accessories.
 - 9.1.6 Sound-abating enclosure.
 - 9.1.7 Dust collection system.
 - 9.1.8 Grit blast chamber.
 - 9.1.9 Liquid argon tank.
 - 9.1.10 Various analog and digital measuring devices.
 - 9.1.11 Fagor CNC 4-axis controller.
 - 9.1.12 Various part and thermal spray gun manipulators.

10 PERSONNEL TRAINING AND CERTIFICATION

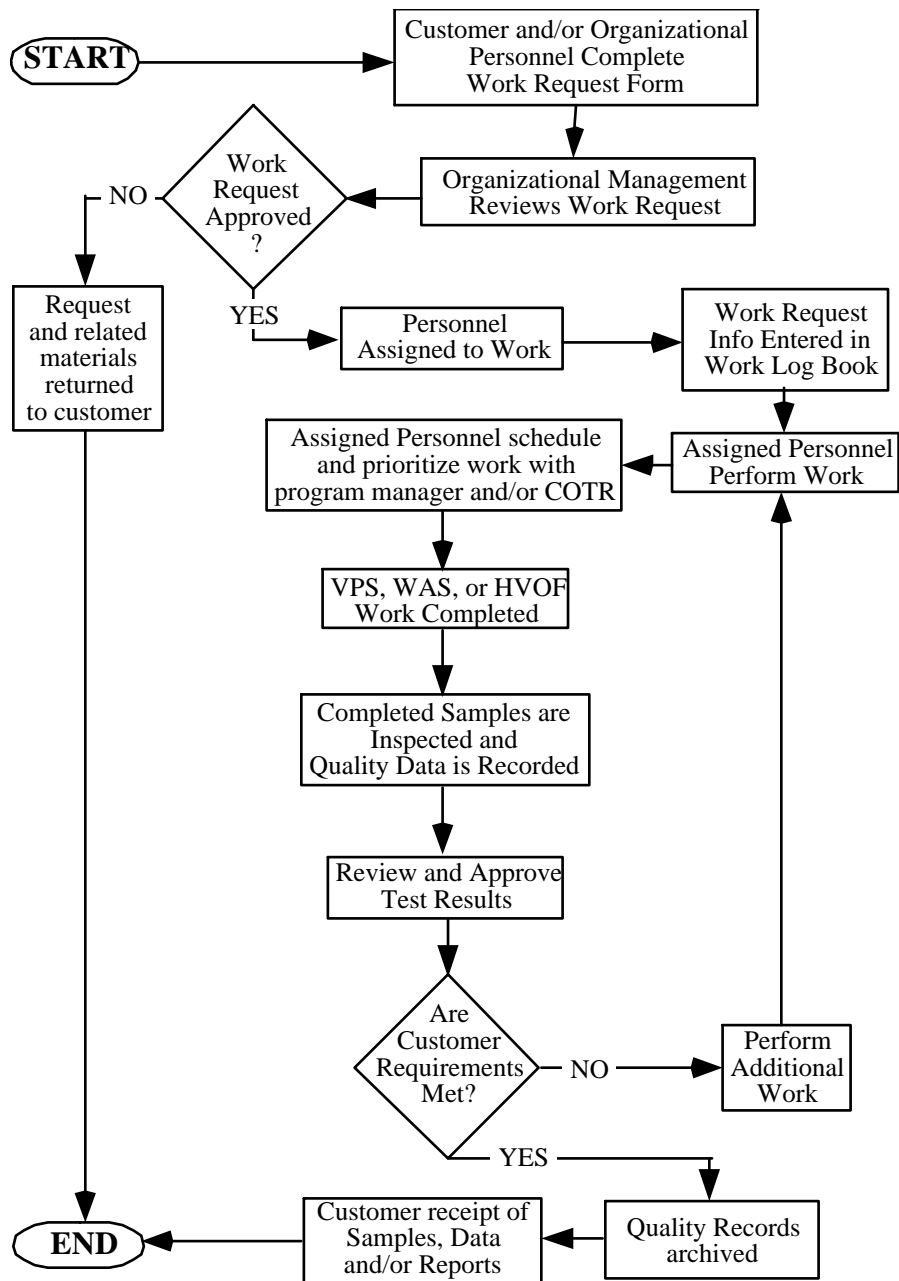
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- 10.1 Civil Service personnel operating TSF equipment as of October 1, 1997 are officially qualified to operate the equipment.
- 10.2 New hires to MSFC or transfers to this facility from within MSFC shall be mentored in the safe operation of TSF equipment by a qualified operator prior to independent operation of the equipment.

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11 FLOW DIAGRAM

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